

# Metres per bit

Paul Moore gets the lowdown on bit wear plus reports on optimisation of drilling through digital tools and other developments in rock drill consumables as well as a new drilling service agreement



*A Boart Longyear percussive bit and rod. The company in this article offers a number of proven tips to help miners achieve more metres per bit*

**D**rilling contractors and mining companies rely on their tooling to get the highest productivity and the lowest cost per metre for every project. **Boart Longyear** Global Product Manager, Jeff Hogan told *IM*: “When purchasing top hammer button bits, for example, choosing a high-quality product designed for the specific ground conditions is only the first step to achieving more metres per bit. Ensuring bits are properly used and maintained is critical to realising a high return on investment.”

## Why button bit wear is important

When a top hammer button bit is sharp, the percussive energy transferred into the rock is at its optimum, resulting in effective rock fracture and a maximum penetration rate for the given drilling parameters. Hogan comments: “As flats develop on the buttons – tungsten carbide inserts – energy utilisation is no longer optimised, leading to a lower penetration rate and reduced productivity. As buttons wear, the bit is less effective at fracturing the rock and the energy is dispersed over a larger surface area. Instead, rock is ground, rather than cut, producing smaller cuttings and energy, no longer used for breaking virgin rock, is reflected

back up the drill string. This reflective energy contributes to increased loads on the tooling, drifter and rig. As a general guideline, refurbishing the buttons before the flats reach a third of the button diameter will maintain penetration/productivity, provide maximum bit utilisation and help extend the life of all drill string components.”

If the button flats are allowed to develop further to where they are considered over-drilled, productivity and the rate of penetration deteriorates. Hogan comments: “In this situation, much of the rock in contact with the buttons is re-drilled and the steel bit face may make contact with the bottom of the hole. Fewer and smaller rock chips are produced and much of the energy is reflected back up the drill string. This sacrifices the life of all the drill string components, is a major contributor to hole deviation, increases wear and tear on drill rig components and results in higher operational costs overall. Top hammer button bits that are over-drilled exhibit broken buttons and impact drilling productivity.”

## Wear by rock type

Button bit wear patterns vary depending on the type of ground and the drilling parameters. If

drilling through hard materials such as quartzite, or drilling with excessive rotation, the wear tends to be greater on the bit circumference. Hogan states: “Thus, when the buttons are sharpened, the diameter across the gauge is less than or equal to the diameter of the bit body. In this situation, the bit tends to bind (gauge-out) in the hole. Drillers should consider bit replacement or restoring the gauge button-to-body gap to the original new condition.”

When drilling in non-abrasive materials, carbide wear is minimised and drilling intervals are possibly longer. “This allows for continued chip removal around the bit and wears away the bit body quicker than the carbides, also referred to as body wash. Similar wear occurs in fractured and loose formations where constant hole cleaning and re-drilling of the materials is required for stabilising the hole and to keep the hole open during retraction. To prevent button loss or shearing under these conditions, the protrusion should be reduced to the original height by scheduling grinding intervals.”

## Over drilling effects

Boart Longyear told *IM* that the detrimental effects of over drilling button bits may not be immediately apparent. However, running dull bits not only slows down drilling rates but escalates costs by reducing the life of the drill string components, the rock drill and the rig components. “Premature button bit insert failures are substantially reduced when over drilling is eliminated and correct sharpening procedures are performed.”

In terms of recommendations on getting the most of out of top hammer bits, the attached table summarises Boart Longyear’s advice to miners. From a complete selection of rods, bits, and shanks to couplings, adapters, and other accessories, the company provides top hammer tooling solutions for any percussive drill and blast application for both surface and underground drilling. Boart Longyear’s experience with drilling equipment comes from more than 127 years of proven performance and service in a variety of applications. The company recently



*(left): Harder ground conditions and drilling with excessive rotation creates wear that tends to be greater on the bit circumference; (right): Body wash often occurs when drilling in non-abrasive materials*

**Recommendations – getting the most out of top hammer bits**

*Jeff Hogan, Boart Longyear Global Product Manager, summarises how mining customers can get the most out of top hammer button bits. Training drillers and mining management on bit care, maintenance and identifying excessive wear can increase the return on investment*

**Inspect bits frequently**

Understanding the ground conditions and regular inspections of a button bit are necessary to prevent over drilling. To ensure optimal performance and life, bits require sharpening before the flat exceeds one third of the button diameter. Working with a technical representative is recommended to establish specific guidelines since the maximum suggested wear before reshaping will depend on the button profile. Drilling in non-abrasive ground can give rise to 'snake skin' (small cracks) on the button surface. If it is not removed by grinding, button fatigue failure occurs.

**Grind protruding inserts**

Drilling in non-abrasive rock results in the bit face wearing faster than the inserts. Excessive insert protrusion, lacking sufficient steel support, can easily mean breakage while drilling and when retracting the bit from the hole. To prevent this from occurring, grind the buttons to restore the protrusion height.

**Button sharpening and reshaping**

If button protrusion is adequate, satisfactory re-sharpening can be achieved by use of a preformed diamond faced tool (cups). Sharpening is performed by holding the tool firmly against the button and orbiting the machine in a circle to achieve a uniform surface finish. Diamond faced tools are designed to cut carbide and not steel. It is therefore recommended to have enough protrusion of the button from the face to avoid damage to the cup, bit or grinding machine. It is important to implement effective grinding tool management since the tool profile gradually changes leading to buttons that no longer match the desired shape. Technical representatives can assist by providing specific recommendations.

**A 'bit' of training**

It is always important to care for and maintain tooling and equipment. Consider training for drillers on getting the most life out of the top hammer button bits. More often than not, drillers come to work to do their very best and everyone wants to improve. Provide them with an opportunity to better their drilling habits by sharing these tips.

launched *My Drill Store*, a new website providing intuitive and convenient ordering of drilling tools and parts online.

**Robit digitalises drill steel**

The new Sense Systems product family from Robit the company says “drills deep into efficiency and safety gains in rock drilling through digitalisation.” The Sense Systems product family is the result of an extensive R&D program lending much of its insights from the thorough understanding of rock and ground drilling Robit has gained during its 30 years of history and growth. The company states that “the Robit brand itself has become a synonym for high-quality drilling consumables all around

the world, and the digitalisation of drill steel was a natural next step.”

In broad terms, Sense Systems seek to add ever deeper levels of understanding and optimisation to the drilling process through digitalisation. A significant leap on this path was taken when Robit became the first company in the world to develop a patented system that can measure hole deviation during the percussive drilling process. The 'S Sense' for Top Hammer surface drilling was launched at the beginning of 2017 after an extensive testing phase. Along with the S, a manual 'M Sense' is on offer, using much of the same R&D knowledge and technology that has gone into creating the ground-breaking S.

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